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Hatch Experiment Station
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HATCH EXPERIMENT STATION

—OF THE—

MASSACHUSETTS

AGRICULTURAL COLLEGE.

BULLETIN NO. 52.

Variety Tests of Fruits. Spraying Calendar.



DURFEE PLANT HOUSE.

MARCH, 1898.

The Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same.

AMHERST, MASS. :
PRESS OF CARPENTER & MOREHOUSE,
1898.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

By act of the General Court, the Hatch Experiment Station and the State Experiment Station have been consolidated under the name of the Hatch Experiment Station of the Massachusetts Agricultural College. Several new divisions have been created and the scope of others has been enlarged. To the horticultural, has been added the duty of testing varieties of vegetables and seeds. The chemical has been divided, and a new division, "Foods and Feeding," has been established. The botanical, including plant physiology and disease, has been restored after temporary suspension.

The officers are:—

HENRY H. GOODELL, LL. D.,	Director.
WILLIAM P. BROOKS, PH. D.,	Agriculturist.
GEORGE E. STONE, PH. D.,	Botanist.
CHARLES A. GOESSMANN, PH. D., LL. D.,	Chemist (Fertilizers).
JOSEPH B. LINDSEY, PH. D.,	Chemist (Foods and Feeding).
CHARLES H. FERNALD, PH. D.,	Entomologist.
SAMUEL T. MAYNARD, B. Sc.,	Horticultrist.
J. E. OSTRANDER, C. E.,	Meteorologist.
HENRY M. THOMSON, B. Sc.,	Assistant Agriculturist.
RALPH E. SMITH, B. Sc.,	Assistant Botanist.
HENRI D. HASKINS, B. Sc.,	Assistant Chemist (Fertilizers).
CHARLES I. GOESSMANN, B. Sc.,	Assistant Chemist (Fertilizers).
GEORGE D. LEAVENS, B. Sc.,	Assistant Chemist (Fertilizers).
EDWARD B. HOLLAND, B. Sc.,	Ass't Chemist (Foods and Feeding).
FRED W. MOSSMAN, B. Sc.,	Ass't Chemist (Foods and Feeding).
BENJAMIN K. JONES, B. Sc.,	Assistant in Foods and Feeding.
ROBERT A. COOLEY, B. Sc.,	Assistant Entomologist.
G. A. DREW, B. Sc.,	Assistant Horticultrist.
H. D. HEMENWAY, B. Sc.,	Assistant Horticultrist.
H. H. ROPER, B. Sc.,	Assistant in Foods and Feeding.
A. C. MONAHAN,	Observer.

The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. Communications may be addressed to the

HATCH EXPERIMENT STATION, Amherst, Mass.

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Summary of the Work

OF THE

Horticultural Division for 1897.

S. T. MAYNARD.

VARIETY TESTS OF FRUITS.

In former bulletins we have given full reports of all the varieties of fruits tested in a tabulated form, but as most of these proved of little value, although offered by nurserymen and others as possessing decided merit, we therefore for this season at least report only upon those that have been found to possess very superior qualities.

APPLES.

Number of Varieties in Orchards 194, Distance of Planting 30x30 ft.

The apple crop in college and station orchards during the past season was fairly abundant, but in quality rather below the average except with a few varieties.

Records were made of each variety during the growing season and, when in the best condition for marketing, specimens were gathered and placed in the cold storage to determine their keeping qualities. The following varieties grown in 1896 were in good condition July 1, 1897: Ben Davis, Delaware Winter or Lawver, Ord Beni, Willow-twig, Whinnerys Late, Langford and Walbridge. In good condition at the present date, Feb. 10, 1898, Ben Davis, Delaware Winter and Walbridge.

Results of Spraying. All the trees except a few checks, were sprayed to prevent the ravages of insect and fungous pests which the past season were rather more abundant than usual. The trees sprayed were much less injured by insects and apple scab, and the fruit was fairer and freer from worms than upon those not sprayed. The Bordeaux mixture combined with Paris green was principally

used, but trials were made with laurel green and arsenate of lead. The laurel green did not give satisfactory results, but arsenate of lead was effective in destroying insects, and no injury to the foliage resulted. The cost of the latter was however considerably greater than Paris green.

Fertilizers. The following formula was used on each tree, well spread under the branches.

Large trees—Sulfate potash 5 lbs.	Small trees—2 lbs.
“ “ Nitrate of soda 2 lbs.	“ “ 1 lb.
“ “ Acid phosphate 3 lbs.	“ “ 2 lbs.

In applying fertilizers to fruit trees and plots the quantity of the three fertilizing elements, i. e., nitrogen, phosphoric acid and potash, used varied according to the soil, season or condition of growth the previous season. When no fruit was produced and the growth of tree or plant has been large, less fertilizer is applied than when the crop has been large and the growth rather small. If the soil is naturally poor more fertilizer is needed than if it is naturally fertile.

PEARS.

Number of Varieties 32, Distance Planted 20x20 ft.

The pear crop was very small owing to the fact that most of the trees were young; most of the varieties were of the newer introductions; only a few of the standard sorts having been grown for comparison. Many of the young trees were seriously injured by aphides and the pear “blister mite,” a remedy for which is found in kerosene emulsion.

PLUMS.

Number of Varieties 94, Distance Planted 15x15 ft.

No fruit on the grounds was so abundant and fine as the plum crop. Of the 50 varieties that fruited 10 were of the Japanese varieties.

The fruit on all of the trees was thinned, resulting in larger size, and most of the varieties ripened, though some of the fruit rotted badly. Of the varieties most affected by the “brown rot” or monilia were the Lombard, Ponds’ Seedling, Yellow Egg, Imperial Gage, Washington, McLaughlin and Spaulding. The fruit on those trees most closely planted or growing in sheltered, rather moist situ-

ations was most injured by the rot; that on trees growing the most rapidly rotted more than that grown on trees of only a moderate growth.

Black-Knot. One of the results of the use of fungicides on the plum trees in the station orchard has been that scarcely a specimen of the black knot can be found on any of the trees, though no knots have been removed for about a year. For treatment of the plum, see Spraying Bulletin.

Summer vs. Winter Pruning.

To determine whether heading in plum trees while dormant or in the early stages of summer growth would give the best results 10 trees, two each of five kinds were selected. The first tree of each variety was severely headed on March 30 and the second May 22, with the following results:

The winter pruned trees made a vigorous growth of a few shoots.
 " summer " " " fair " " many "
 " winter " " developed a fair quantity of fruit buds.
 " summer " " " large " " "

The following new varieties have given the best results.

DOMESTICA.

Thomas (Peach?) ripened July 31, large yellow, shaded with red, freestone, fair quality.

Czar, ripened, July 31, large purple, fine quality.

Lincoln, " Aug. 5, medium to large, purple, good quality.

German Prune, " Aug. 29, " " " freestone " "

Kingston, " Sept. 15, large rather acid, late.

JAPANESE.

Red June, ripened, July 26, medium to large, fair quality.

Abundance, " July 30, large, good quality.

Georges, " July 30, medium to large, fair quality.

Burbank, " Aug. 14, large, firm, fair quality.

Chebot, " Sept. 1, medium to large, good quality.

Satsuma, " Sept. 10, large, valuable for canning.

The Abundance ripened fruit prematurely on some of its branches. The Georgeson and Chebot were severely injured by the shot-hole fungus. Fertilizers used on the plum trees were:

2 to 3 lbs. sulfate of potash,	}	According to size and vigor of tree.
1 to 2 lbs. nitrate of soda,		
2 to 4 lbs. acid phosphate.		

CHERRIES.

Varieties 35, Distance Planted, 20x20 ft.

The crop of cherries was not as large the past season as usual and was of rather poor quality. No means has yet been found to wholly prevent the work of the plum curculio that causes the wormy fruit, and the brown fruit rot that so often attacks the blossoms and fruit. The use of Paris green combined with the Bordeaux mixture in almost every case caused more or less burning of the foliage.

The black cherry aphides or plant lice came on in such numbers early in the summer as to do considerable damage. We were unable to see very decided improvement in any new variety fruited over the old standard sorts, the most satisfactory of which are E. Richmond, Montmorency, Royal Duke, Black Tartarian, Napoleon, Governor Wood, Smidt and Windsor.

The fertilizers used, 2 lbs. sulfate of potash, 1 lb. nitrate soda, 2 lbs. acid phosphate, per tree.

The growth notwithstanding the abundance of insects and fungous pests has been good and an unusually large number of fruit buds have been formed for next season's fruiting.

THE GRAPE.

Varieties 200, Distance Planted, College Vineyard, 6x8 ft., Station Vineyard, 8x10 ft.

The experiments with this fruit have been conducted in the college vineyard planted in 1868 and 1869 and in the station vineyard, where the vines are from 1 to 10 years old and, where each year the decidedly promising new varieties, offered in the market are planted. The former consists principally of the Concord variety with a few vines each of some of the leading commercial kinds.

The crop in the station vineyard was more uneven than for many years, largely due to the continued wet weather in July. Some varieties proved entire failures while others were especially fine.

The crop in the college vineyard was exceptionally fine in quality but not quite as large as in 1896. The fruit sold readily in the local market for five cents per pound.

Results of Spraying. The college vineyard, except check rows, and one vine of the two of each variety planted for experiment in the station vineyard were sprayed according to the cal-

endar for 1897 with decidedly favorable results, but not with the benefit of previous years.

Method of Training. The vines in both vineyards are trained according to the one arm renewal system Fig. 1, which proves very satisfactory, requiring much less labor and skill to produce superior fruit than any other. Thinning the fruit is practiced, all small bunches being removed as soon as well set, leaving only a limited number of large bunches on each vine.

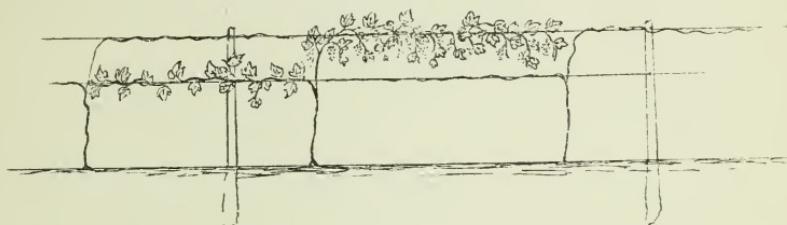


Fig. 1

The varieties that we would recommend for general planting for market and home use are Green Mountain, Herbert (Rogers No. 44) Worden, Moore's Early, Concord, Delaware, and Brighton if planted near other varieties that produce an abundance of pollen.

Campbell's Early. This new variety, introduced with so much praise is growing in the vineyards and shows a vigorous habit and firm healthy foliage. From samples of the fruit sent us for testing and from the many reports of disinterested parties we are led to think if it develops no weakness, that it will be one of the best grapes ever introduced for home use or market in New England. It should be closely watched by all grape growers in Massachusetts for we are in need of an earlier grape than the Concord or Worden and one of much better quality than Moore's Early to make grape growing a success.

Fertilizers Used. On college vineyard, 200 pounds sulfate of potash, 100 pounds nitrate of soda, 150 pounds acid phosphate, per acre. On station vineyard, $1\frac{1}{2}$ tons Canada ashes per acre.

CURRENTS.

Number of Varieties 25.

The currant crop has been one of considerable profit above the cost of cultivation, although the proceeds from it are not large. The area planted covers about three-fourths of an acre. They are

grown among quince bushes that are planted 10x12 feet, with the currants 5x6 feet between the rows.

In addition to the three standard sorts, the Cherry, Fays Prolific and Versailles that are commonly grown, may be mentioned the Red Cross, President Wilder, Pomona and White Imperial, all of which are of good size and apparently productive. The fruit of the Wilder and Pomona perhaps being larger than the Red Cross, and the Pomona better in quality than either.

The best currant in quality without doubt is the White Imperial, being less acid and possessing a peculiar spicy, aromatic flavor.

The Currant Leaf Blight appeared in many locations and did great damage where the plants were not well sprayed, the leaves nearly all falling off before the fruit was ripe. This disease can be prevented by spraying with the Bordeaux mixture, just before the blossoms open, and again as soon as the fruit has been gathered.

Currant Worms.—The common currant worm was destroyed by hellebore and insect powder (Pyrethrum) at the rate of one-half pound to 50 gallons or one tablespoonful to a common pailful of water, or by using these insecticides with the common bellows or Paris green gun when the foliage was wet. Fertilizers used for both currants and quinces, 200 pounds sulfate of potash, 100 pounds nitrate of soda, 300 pounds acid phosphate.

GOOSEBERRIES.

Number of Varieties 23, planted among trees at varying distances.

This crop was not as abundant or satisfactory as usual on account of the extremely wet weather during July, and mildew appeared on many varieties. Among those that show the most merit are Chautauqua, Columbus, Triumph, Downing, Pale Red and Lancashire Ladd. The Industry while one of the best in quality and of the largest size has been very weak in growth.

BLACKBERRIES.

Number of Varieties, 28, Distance Planted 5x7 ft.

The conditions of the past season were in many particulars favorable for a large crop and that from the station plots was much above the average.

The older varieties retain about their former standing as to size,

productiveness, quality and hardiness. The Snyder and Taylors being the most certain of producing paying crops.

The Eldorado made a fine showing of fruit that was of good size and quality. The plants so far have proved very hardy vigorous and productive and unless some weakness is developed it will be safe and profitable to plant it.

The Rathbun fruited for the first time the past season and while it shows decided merits, must be grown one or two seasons more before its real value can be determined.

Ohmer. Only a few plants of this variety fruited, but the yield was remarkable, the size large and quality about the average.

Erie. This variety, until the present season has badly winter killed and produced little or no fruit. This year's fruit was of large size, and good quality. The following table shows the comparative record of six varieties :

	Date of blooming.	Date of ripening.	Vigor.	Quality.	Size.	% Winter killing.	Yield for 25 hills.
Erie	June 5	July 16	8	8.5	l.	18	34 qts.
Ohmer	" 7	" 20	8.5	8	v. l.	13½	70½ "
Minnewaski	" 2	" 18	9	8.5	m.	12	33 "
Eldorado*	May 30	" 18	9	9	l.	5	21½ "
Snyder	" 28	" 17	8	8	m. l.	0	45 "
Stone's Hardy	June 5	" 16	8.5	8.5	m.	15	32 "

*Rather young plants.

Explanation of tables.—Vigor and quality are based on a scale of 1 as the lowest grade, 10 the highest. Winter killing, on the scale of 100, 0 indicating perfect hardiness. Sizes, m. medium, l. large, v. l. very large, m. l. medium large.

The Orange Rust. In addition to the application of fungicides according to the calendar for 1897, all rusted canes were cut out as soon as they appeared, with the result that little or no injury was done by this disease.

Fertilizers used were as follows, 150 pounds nitrate of soda, 150 pounds acid phosphates, 150 pounds sulfate of potash per acre.

RED RASPBERRIES.

Number of Varieties 25, Distance Planted 5x7 ft.

The red raspberry plants came through the winter of 1896—97 with little injury and the crop was unusually good. The heavy and continued rains during harvesting made it very difficult to secure the crop in a good condition for market. Of the old varieties the Cuthbert may still be considered the most valuable though the canes are tender and must be covered during the winter to ensure a full crop every year.

The two varieties of more recent introduction giving the greatest promise, are the King, an early variety, reported in former bulletins as Thompson's Pride, and the Loudon, ripening with the Cuthbert. Thus far they have proved hardy, vigorous, productive and of good quality.

The Miller or Miller's Early has done fairly well but has fruited only two seasons, so that further trial is needed to determine its value. It is reported in many sections of the country as valuable while in others as of no more value than the Hansel and Thompson's Early Prolific.

The following table shows the standing of the above four varieties :

	Date of blooming.	Date of ripening.	Vigor.	Quality.	Size.	% Winter killing.	Yield of 25 hills.	Firmness.
Cuthbert	June 5	July 5	10	8	1.	20	37.3 qts.	m.f.
King	May 30	June 29	9	9	m. l.	20	26.3 "	f.
Loudon	May 5	July 10	10	9.5	1.	5	37½ "	f.
Miller's Early*	May 5	June 25	8.5	9	m. l.	10	14.3* "	m.f.

*Young plants.

Explanation of table.—Vigor and quality are expressed on a scale of 1 to 10, 10 indicating the highest grade. Size and winter killing by same terms as in former tables. Firmness, f. firm, m. f. medium firm.

The different varieties received the same treatment as to fertilizers and spraying for fungous diseases as the blackberries previously reported. The part of the plantation sprayed, showing much less leaf blight and anthracnose than that not sprayed.

BLACKCAP RASPBERRIES.

Number of Varieties 26, Distance Planted 5x7 ft.

This crop was the largest for many years. Most of the varieties came through the winter uninjured, and the early summer was favorable to a perfect growth. As with the red raspberry however considerable fruit was destroyed by the heavy rains. The varieties ripened their fruit this season more nearly at the same time than usual. The following table shows the standing of a few of the best varieties :

	Date of blooming.	Date of ripening.	Vigor.	Quality.	% Winter killing.	Size.	Yield 25 hills.	Firmness.
Cromwell	June 5	June 28	7	8.5	2	m.	33.9 qts.	f.
Brackett's Seedling	" 3	July 4	8.5	8	5	l.	29.7 "	f.
Eureka	May 28	" 6	8.5	9	10	m.	48.8 "	f.
Hilborn	June 5	" 4	9.5	9.5	8	l.	31.7 "	f.
Kansas	" 1	" 2	9.5	7.5	15	m.l.	35 "	f.
Lovett	May 28	" 4	8	9	0	m.	39 ³ ₄ "	f.
Older	" 28	" 4	8.5	8	5	l.	45 "	f.
Souhegan	" 31	June 27	9	8.5	10	m.	20.7 "	f.

SHAFFER SEEDLING RASPBERRIES.

A collection of some 350 varieties of seedlings of the above purple cap or hybrid variety have fruited the past season with most interesting results. The seed was selected from the finest berries from a row of this purple cap or hybrid variety which stood between a field of Marlboro's on the one side and Thompson's Prolific on the other. More than half of the seedlings are of the red raspberry type (*Rubus strigosus*) the majority of the fruits however being purple in color like the parent or like that of the old variety Philadelphia and nearly all were of good size and quality.

Many of the plants produced large, well formed berries of a bright scarlet color and of the best quality. Some show great promise. Among these seedlings were found almost every style of development between the nearly typical form of the Blackcap (*Rubus occidentalis*) and that of the wild red raspberry (*R. strigosus*) and also a few albino or white or yellow forms of both species.

Another lot of seedlings of about the same number, from the same source will fruit the coming season for the first time.

NEW SPECIES OF THE GENUS RUBUS.

The *Logan berry*, *Salmon berry*, *Musk berry*, *Strawberry-raspberry*, *Golden Mayberry*, etc., have not been tested long enough to prove if they have any value in New England.

Of these, the Logan berry seems to possess the greatest merit, but as yet its habits of growth and the special treatment that will give the best results have not been determined. It is not generally hardy, requiring covering with soil or mulch during the winter and probably will give the best results when treated like the dewberry.

The Strawberry-raspberry, an herbaceous perennial, the tops of which die down every winter and reproduce numerous shoots in the spring, has fruited abundantly in some places, but the quality is poor. The fruit is large and showy and something valuable may be hoped from seedlings of this species or from hybrids with it and some of our hardy species of Rubus, now in cultivation. A covering of coarse straw, or manure about this and the Logan berry will be undoubtedly best for winter protection.

STRAWBERRY.

Number of Varieties 200, Distance Planted 3x2 ft.

The new varieties of strawberries on the station grounds are grown in plots, 25 plants of each kind being planted in each plot or row. They were planted in April and one-half of each row allowed to produce only two runners, thus :

*	*	*	*	*	*	*	*	*	*	*	*
o	o	o	o	o	o	o	o	o	o	o	o
*	*	*	*	*	*	*	*	*	*	*	*

While the other half made five runners each thus

*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
o	*	o	*	o	*	o	*	o	*	o	*	o	*	o	*	o	*	o	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

* New plants. o Old plants.

Enough of the runners that were to be removed of each kind were allowed to become nearly rooted before taking them off to supply stock plants for future trials. These plants were heeled in closely in well prepared beds, and if the weather was dry, well shaded for a

few days until well rooted. If runners are thrown into a pail of water as they are taken off they are more certain to grow than if kept in a basket until they can be set out in the bed.

Varieties showing decided merit in the plots are then planted in the field and are grown in both the *close* and the *open* matted row. In the former the plants are allowed to produce all the runners they will until August or September when they are thinned out to from three to five inches apart, while in the latter the plants are located as they grow at a distance of from four to six inches apart and all other runners are removed as soon as the rows are full.

The runners of desirable varieties are removed from beds grown under either system and are heeled in and rooted for the next season's planting or for sale and we consider them much more valuable than plants that have not been transplanted. This practice is a great advantage, for the field crop is very much improved by the removal of the surplus runners and if the plants are not needed for setting in the spring they will produce a larger crop of fruit that will more than pay the cost of transplanting and winter's care. In case they are to be fruited it would be best to set them in rows or beds not over three feet wide with paths of about two feet wide between them.

Fertilizers used. The plots were fertilized, first by deeply ploughing under about eight cords of stable manure to the acre and then thoroughly fitted, using 200 pounds sulfate of potash, 200 pounds acid phosphate and 150 pounds nitrate of soda per acre. The strawberry field was fertilized with about five cords of stable manure deeply ploughed under, then dressed with two tons of Canada ashes and 100 pounds nitrate of soda, 165 pounds sulfate of potash and 165 pounds acid phosphate, per acre. The following table gives the behavior of the ten varieties that show the best results :

Variety.	Sex.	Vigor.	Blooming-May.	Ripening first berry, June.	Best picking June.	Productiveness	Size.	Form.	Color.	Firmness.	Quality.	Yield ots. per acre.
Clyde	st. 9	1	6	23	10	l.	r.c.	l.sc.	f.	8.5	8,441	
Brandywine*	st. 8.5	1	12	27	8.5	l.	r.c.	sc.	f.	9.5	4,513	
Boynton	p. 8	6	13	30	9.5	m.	c.	sc.	s.	7.5	5,201*	
Howard's No. 14	p. 9.5	6	8	19	9	l.	c.	sc.	m.	9	5,043	
Haverland	p. 8.5	1	7	19	9	m.	c.	l.sc.	m.	7.5	4,486	
Aroma	st. 8.5	7	12	25	8	m.	irreg.	sc.	m.	8.5	4,336	
Bisel	p. 9	15	12	22	8	m.	c.	d.sc.	m.	7.5	4,200	
Howard's No. 36	p. 8.5	4	6	19	8	m.l.	l.c.	l.sc.	m.	8	4,133	
Greenville	p. 8	7	14	23	8	l.	c.	sc.	s.	8.5	3,835	
Glen Mary	st. 8.5	13	14	25	8	v.l.	irreg.	d.sc.	f.	8.5	3,765	
Parker Earle*	st. 9	10	13	28	9	l.	c.	l.sc.	f.	9	6,525*	

*In field.

Explanation of table.—St. indicates staminate. P. indicates pistillate. Vigor, production and quality are indicated by 10 as perfect and 1 as worthless. Size and firmness same as red raspberry. Form, r. round, c. conical, irreg. irregular. Color, l. light, sc. scarlet, d. dark.

The Brandywine, Howard's No. 41 and Parker Earle did not show the yield in the plots that they did in the field. The Bubach did not keep up to its former yield and the Marshall while producing large and very fine berries did not yield more than one-half the quantity of any of the variety reported in the above table.

The Bismarck resembles the Bubach in growth of plant, with berries of a large size, of lighter color, better form and quality. A very promising variety but will require another season's trial to determine its value for general planting. The Sample and a large number of highly praised varieties were planted last spring, but as only the growth of the plants can be reported they are not mentioned. Something over 500 varieties of seedling strawberries are being tested many of which show decided merit. None of these will be propagated for distribution unless they show very decidedly qualities superior to those varieties already introduced.

Spraying for the Destruction of Insects and Fungous Growths.

The results of spraying during the past season to protect crops from insects and fungous pests, again show the great benefits derived from this work.

All of the fruit and vegetable crops grown on the college grounds generally injured by the above pests, were treated according to the spraying calendar of 1897 and in most cases with marked beneficial results.

PUMPS AND NOZZLES.

There has been considerable improvement made in the pumps and nozzles put upon the market in the past year, and many new pumps have been offered. Whatever the kind of pump purchased it is important that it be used carefully, that the spraying material, if containing coarse particles, be carefully strained before use, that all parts be kept well oiled and after using that the pump be cleaned by pumping sufficient clear water through it to clear it of corroding materials.

Good judgment and considerable mechanical skill must be exercised to get the best results with any complicated machine, and only those persons possessing these qualifications should be allowed to use the pumps.

INSECTICIDES.

While there are many new insecticides offered, there is so little exact knowledge of their effect upon farm and garden crops that until further trial is made we can only recommend for general use *Paris green* and *hellebore* for chewing insects and *kerosene emulsion* for sucking insects, with *pyrethrum* or insect powder in a very few cases.

KEROSENE EMULSION.

Formula. $\frac{1}{2}$ lb. common bar soap,
 2 gallons common kerosene.

Cut the soap into small pieces or shavings and dissolve in about two gallons of hot water. While still hot, pour in the kerosene and

with the hand pump or syringe, pump it back and forth until a thick cream-like substance is formed. In this condition the kerosene is divided into very minute globules and will be readily diluted or suspended in water.

Before using, add water enough to make

- (A) 10 gallons of emulsion
- (B) 20 " " "

Formula A, to be used when the insects are in large numbers and the foliage is known not to be easily injured by it.

Pyrethrum Powder and *Hellebore* should be obtained in a perfectly fresh condition and be kept in glass stoppered jars.

FUNGICIDES.

BORDEAUX MIXTURE.

Formula. 4 lbs. Copper Sulfate, (*Blue Vitriol*).

4 lbs. Caustic Lime (Unslaked Lime.)

Dissolve the copper in hot water. (If suspended in a basket or sack in a tub of cold water it will however dissolve in from two to three hours.)

The lime is then slaked in another vessel adding water slowly that it may be thoroughly slaked. When both are cool, pour together, straining the lime through a fine mesh sieve or burlap strainer, and thoroughly mix. Before using, add water enough to make 50 gallons of the mixture.

The active agent in this mixture is the copper, the lime being used simply to hold it in place upon the foliage and branches of the plants sprayed. Here it is given up gradually, destroying the spores of the fungi as they are brought in contact with it by the surrounding atmosphere.

Should the lime be air slaked at all more than four pounds may be needed as it will have lost much of its strength.

This fungicide is recommended as more satisfactory than any other, from the fact that it adheres a long time to the branches, buds and leaves and seldom causes any injury to the foliage.

It has been found more effectual if made up fresh for each application. Two or three thorough applications give better results than many light ones.

When both fungous growths and insects attack a crop, Paris green

should be applied with the Bordeaux, as in a combined state both are as effective as if used singly, one-half of the labor is saved and there is less danger from injury to the foliage by the Paris green than if used alone.

DILUTE COPPER SULFATE SOLUTION.

After the fruit has nearly matured it is often disfigured by the adhesion of the Bordeaux mixture, and in place of the Ammoniacal carbonate of copper recommended in Bulletin No. 37, we would advise the use of copper sulfate 2 oz. to 50 gallons of water. The foliage of many plants will stand a much stronger solution, but this is as concentrated as can be generally used.

SPRAYING CALENDAR.

PLANT.	FIRST APPLICATION.	SECOND APPLICATION.
APPLE <i>(Scab, codlin moth, bud moth. Tent caterpillar, canker worm, plum curculio.)</i>	When buds are swelling, Bordeaux.	If canker worms are abundant just before blossoms open, Bordeaux and Paris green.
BEAN <i>(Anthracnose.)</i>	When third leaf expands, Bordeaux.	10 days later, Bordeaux.
CABBAGE <i>(Worms.)</i>	Insect powder.	7-10 days later Insect powder.
CHERRY* <i>(Rot, aphis, slug. Black Knot.)</i>	As buds are breaking, Bordeaux; when aphis appears, kerosene emulsion.	When fruit has set, Bordeaux. If slugs appear, dust leaves with air slaked lime or Hellebore.
CURRENT GOOSEBERRY } <i>(Worms. Leaf Blight.)</i>	At first sign of worms, hellebore.	10 days later, hellebore. Bordeaux.
GRAPE <i>(Fungous diseases. Rose bug.)</i>	In Spring when buds swell, Bordeaux.	Just before flowers unfold, Bordeaux.
NURSERY STOCK <i>(Fungous diseases.)</i>	When first leaves appear, Bordeaux.	10-14 days, repeat first.
PEACH, NECTARINE <i>(Rot, mildew.)</i>	As the buds swell, Bordeaux.	When fruit has set, Bordeaux.
PEAR <i>(Leaf blight, scab, psylla, codlin moth, blister mite.)</i>	As buds are swelling, Bordeaux.	Just before blossoms open, Bordeaux. Kerosene emulsion when leaves open for psylla.
PLUM* <i>(Curculio. Black knot, leaf blight, brown rot.)</i>	When buds are swelling Bordeaux.	When blossoms have fallen, Bordeaux and Paris green. Begin to jar trees for curculio.
QUINCE <i>(Leaf and fruit spot.)</i>	When blossom buds appear, Bordeaux.	When fruit has set, Bordeaux.
RASPBERRY, BLACKBERRY, } <i>(Rust, anthracnose, leaf blight.)</i>	Before buds break, Bordeaux.	Bordeaux, just before the blossoms open.
STRAWBERRY <i>(Rust.)</i>	As soon as growth begins, with Bordeaux.	When first blossoms open. Spray young plantation, Bordeaux.
TOMATO <i>(Rot, blight, flea beetle.)</i>	Before appearance of blight or rot, Bordeaux.	Repeat first if diseases are not checked. Fruit can be wiped if disfigured by Bordeaux.
POTATO <i>(Flea beetle, Colorado beetle, blight and rot.)</i>	Spray with Paris green and Bordeaux when grown.	Repeat before insects become numerous.

*Black knot on plums or cherries should be cut and burned as soon as discovered.

THIRD APPLICATION.	FOURTH APPLICATION.	FIFTH APPLICATION.
When blossoms have fallen, Bordeaux and Paris green.	8-12 days later, Bordeaux and Paris green.	10-14 days later, Bordeaux.
14 days later, Bordeaux.	14 days later, Bordeaux.	Spraying after the pod is one-half grown will injure them for market.
7-10 days later, Insect powder.	Repeat third in 10-14 days if necessary.	
10-14 days if rot appears, Bordeaux.	10-14 days later, weak solution of copper sulphate.	
If worms persist, hellebore.	After fruit is gathered, Bordeaux.	
When fruit has set, Bordeaux.	2 to 4 weeks later, Bordeaux.	2 to 4 weeks later, if any disease appears, weak solution of copper sulphate.
10-14 days repeat first.	10-14 days repeat first.	10-14 days, repeat first.
When fruit is one-half grown, Bordeaux.	5-7 days later, weak solution of copper sulphate.	5-7 days later, repeat fourth.
After blossoms have fallen, Bordeaux and Paris green, Kerosene emulsion, if necessary.	8-12 days later, repeat third.	10-14 days later, Bordeaux.
10-14 days later, Bordeaux.	10-20 days later, Bordeaux.	10-20 days later, weak solution of copper sulphate.
10-20 days later, Bordeaux. (Orange or red rust is treated best by destroying the plant.)	10-20 days later, Bordeaux. Spray after fruit is gathered with Bordeaux.	10-20 days later; Bordeaux.
Spray young plantation Bordeaux.	Repeat third if foliage rusts.	
Repeat first when necessary.		
Repeat for blight, rot and insects as potatoes approach maturity.		

*For aphides or plant lice use kerosene emulsion on all plants.





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